may be entitled to levels of protection beyond those which can be achieved with the allowable uplink e.i.r.p. limits;[45]

Second, the Commission must similarly revise proposed rule Section 25.213(c) as recommended for footnote 731E to clarify that the protection to be afforded is limited to the applicable uplink e.i.r.p. limits;

Third, the Commission must revise Section 25.143(b)(2)(iv) so that it addresses a quantitative, defined criteria, adopted by rule or agreed upon by the parties concerned, rather than subjecting a LEO MSS applicant to the impossible task of demonstrating that its "operations will not cause unacceptable interference to other authorized users of the spectrum" where the interference is not defined or quantified; and,

Fourth, the Commission must adopt a revised rule section 25.213(b) to encompass out-of-band emission limits for MSS with regard to protection of both GPS and GLONASS below 1606 MHz.

Adopting rules for MSS as outlined above will send a clear signal to the Russian administration that the U.S. stands firmly behind the U.S. MSS systems and will not require MSS systems to protect GLONASS operations above 1606 MHz. Moreover, GLONASS receiver manufacturers and systems requirements setting organizations will be placed on notice to install filters preventing receipt of transmissions above 1606 MHz, and to

---

[45] See Petition for Clarification and Partial Reconsideration of Loral Qualcomm Satellite Services, Inc., in ET Docket No. 92-28 (filed Mar. 30, 1994).

incorporate other design improvements which will enhance MSS sharing with GLONASS users.

But, most importantly, implementing the LQP proposals will enable the Commission to move ahead to finalize this proceeding, to adopt MSS licensing and service rules and to issue licenses, without the need for an interim spectrum plan and the uncertainty such a plan would entail. This approach also would allow systems which are prepared to go forward to do so with certainty as to the bands of operation and would provide certainty to the investment community concerning LEO MSS. Moreover, it would reduce administrative burdens on the Commission by eliminating the need to revisit either the spectrum sharing plan or rules regarding MSS/GLONASS sharing.

To implement these recommendations, LQP proposes the following specific rule revisions:

(1) Revise International Footnote 731E in the U.S. Table of Allocations as proposed in LQP's Petition for Clarification and Partial Reconsideration in ET Docket No. 92-28, to eliminate the final sentence.

(2) Revise proposed Section 25.213(c)(1) to read as follows:

> Mobile-satellite Earth stations transmitting in the 1610-1626.5 MHz band shall limit e.i.r.p. density levels to no greater than -15 dB(W/4kHz) on frequencies being used by systems operating in accordance with International Radio Regulation RR 732, and to no greater than -3 dB(W/4kHz) on frequencies that are not so being used.

(3) Eliminate proposed Section 25.143(b)(2)(iv).

(4) Revise proposed Section 25.213(b) to encompass reasonable out-of-band emission limits for both GPS and GLONASS (below 1606 MHz) as follows:

> Protection of the radio navigation-satellite service operating in the 1559-1610 MHz band. Mobile Earth stations operating in the 1610-1626.5 MHz band shall limit out-of-band emissions in the 1574.397-1576.443 MHz band and the 1598 to 1606 MHz band so as not to exceed an e.i.r.p.. density level of -50 dB(W/MHz) averaged over any 20 ms period.

With regard to its first recommendation, i.e., the proposed revision of Footnote 731E, LQP incorporates by reference its comments on this subject made previously. In its Petition for Clarification and Partial Reconsideration in ET Docket No. 92-28, LQP stated that MSS systems should be permitted to operate within the uplink e.i.r.p. limit of -15 dBW/4kHz prescribed in Footnote 731E, notwithstanding other, seemingly contradictory language in the footnote. If this rule is not revised, the Commission would perpetuate the ambiguity in the footnote, which, on the one hand provides for uplink e.i.r.p. limits for MSS systems operating in the 1610-1626.5 MHz band, but on the other hand, appears to require MSS systems to protect aeronautical radionavigation systems, e.g., GLONASS, regardless of what e.i.r.p. density limits would be imposed on the MSS system. The constraints on MSS systems that may be required by the final sentence in the footnote have no demonstrated benefit to aeronautical navigation functions. In the NPRM, the Commission proposed to incorporate this same contradictory language in Section 25.213(c)(1).

A detailed review of GLONASS, its frequency plan and operations, recent actions of the Russian administration concerning revision of the frequency plan, as well as the need for and possible use of GLONASS in navigation should convince the Commission that this language is unnecessary as well as destructive to MSS. In fact, LQP has undertaken intensive review of this subject.

This review has led LQP to recommend the above rule revisions because neither the aviation community nor the Russian Federation has demonstrated that corruption of a single GLONASS measurement will cause harmful degradation in the ability to navigate. Developing protection criteria on a single measurement basis, instead of the ability to navigate, is faulty system engineering. Moreover, even without frequency revision, sufficient GLONASS signals below 1606 MHz will provide for integrity checks on navigational functions in conjunction with GPS. Thus, there is no need to impose stringent restrictions on MSS uplinks operations.

At the present time, in addition to other means of aiding navigation, the international aviation community may be considering the use of the U.S. DOD-funded Global Positioning System (GPS) for navigation and GLONASS for integrity checking of the results of GPS navigation solutions. The Commission recognized in the NPRM that the aviation community may employ

both of these systems for "sole means" navigation.[46] NPRM, ¶ 55. However, more recently, it has been noted that other means of integrity checking, such as barometric aiding and wide area augmentation systems, are being investigated.

In order to analyze the GLONASS issue in depth, LQP contracted with Sat-Tech Systems, leading specialists on avionics and aviation navigation, to provide further analysis. A detailed discussion concerning the use of GLONASS and the protection it requires is contained in Sections 2.2.3, 2.2.4 and 2.2.5 of the Technical Appendix and Attachment 1. As demonstrated there, even if the international aviation community decides that the GNSS should include both GPS and GLONASS, all the GLONASS frequencies are not required to achieve the benefits of using both systems. The Sat-Tech study supports the conclusion that virtually all aviation objectives can be achieved through use of GPS and as few as six GLONASS satellites operating below 1606 MHz.[47] The Sat-Tech study further points out that other navigation systems, including terrestrial differential GPS, geostationary satellites, wide-area augmentation systems (WAAS) and use of barometric altimeters on-board aircraft, also will be used in conjunction

---

[46] An extensive description of the use of GLONASS in navigation is contained in LQSS' Comments in ET Docket No. 93-198, filed July 19, 1993, pages 15-18.

[47] Current planning of the Russian Federation indicates up to 24 satellites operating below 1606 MHz at the time of MSS service launch. Thus, with anti-podal operation, there will be 12 GLONASS satellites available for GNSS, which is sufficient to handle GLONASS failures.

with the GNSS, as appropriate and will increase integrity even further.

Thus, the GNSS need not include GLONASS frequencies above 1606 MHz to achieve its operational objectives and requirements. Consequently, the protection by MSS of receipt of GLONASS signals above 1606 MHz is neither necessary nor desirable, and would merely impose substantial and intolerable burdens on MSS.

However, if the Russian Administration seeks protection for receipt of all frequencies it is transmitting, it should agree to revise its spectrum plan. The Commission can and should play an important role by taking the actions outlined above, as well as to work within the U.S. government to achieve agreement of the Russian Administration to revise its frequency plan.

These actions regarding MSS/GLONASS sharing will enable the Commission to accomplish important public interest objectives in advancing MSS, providing certainty to system operators and investors, and affording protection for a portion of the GLONASS system if included in a GNSS.

D. The Commission Can Increase the PFD Limit in the 2483.5-2500 MHz Bands In Order to Enable CDMA LEO MSS Systems to Achieve Capacity Objectives Without Causing Harmful Interference to the Fixed Service.

In the NPRM, the Commission notes that over 700 fixed terrestrial stations, including temporary fixed (transportable) stations, are licensed and operating in the U.S. in the 2483.5-2500 MHz band. NPRM, ¶ 70. The Commission also notes that since 1985, the Commission has prohibited further terrestrial licensing

in the band. Id. The Commission states that it accepts the NRC's finding that interference problems between terrestrial fixed-services at 2483.5-2500 MHz and MSS downlinks operating in excess of the power flux density (PFD) levels prescribed by RR 2566 would be amenable to coordination. NPRM, ¶ 66. LQP agrees that MSS systems using the 2483.5-2500 MHz band will be able to operate without causing harmful interference to fixed service licensees in the band. Moreover, LQP urges that the Commission revise the PFD limits in order to enable the MSS systems using the 2483.5-2500 MHz to enhance capacity and sharing with other MSS operators, and avoid needless time-consuming and costly coordinations. LQP has conducted detailed analyses of the U.S. sharing environment in this band. These analyses confirm that a typical CDMA LEO MSS system can operate at a slightly higher PFD without causing harmful interference to fixed systems in this band.

LQP previously has commented on the adoption into the U.S. Table of Allocations, by the Commission, of International Footnote 753F, which contains the PFD limits adopted at WARC-92, and recommended that these limits be raised.[48]

In the MSS Allocation Order, the Commission adopted ITU Radio Regulation 753F, applicable to the 2483.5-2500 MHz band, for the United States Table of Allocations. As currently written, RR 753F does not promote the public interest in

---

[48] See Petition for Clarification and Partial Reconsideration of Loral Qualcomm Satellite Services, Inc., ET Docket No. 92-28, at 7-10 (filed Mar. 30, 1994).

enhancing maximum flexibility in provision of MSS service in the United States. Accordingly, LQSS urges that the Commission make two revisions of RR 753F for the United States.

First, the Commission should adopt a modest increase in the power-flux density (PFD) values. Second, the Commission should clarify that these values are coordination triggers, rather than absolutes.

1. To Achieve the Maximum Benefit of the New MSS Services, the PFD Levels Must Be Increased.

Based on recent information, LQSS proposes that the Commission replace the values in RR 753F with the following:

> -149 dB(W/m^2) in any 4 kHz band for angles of arrival between 0 and 5 degrees above the horizontal plane;
>
> -149 + 0.65(δ - 5) dB(W/m^2) in any 4 kHz band for angles of arrival δ (in degrees) between 5 and 25 degrees above the horizontal plane;
>
> -136 dB(W/m^2) in any 4 kHz band for angles of arrival between 25 and 90 degrees above the horizontal plane;
>
> Where δ is the angle of arrival from the satellite to any point on the earth's surface.
>
> These limits relate to the power flux-density which would be obtained under assumed free-space propagation conditions.

Use of these slightly higher values will enable systems such as Globalstar to proceed without the need for time-consuming and unnecessary coordinations with terrestrial systems.

A recent analysis of the impact of proposed Globalstar operations on fixed services operating in the 2483.5-2500 MHz band suggests that MSS LEO operations at the higher PFD values

proposed above would not cause interference. Output Document 2-2/TEMP/1(Rev.5)-E, at 3, (Feb. 8, 1994), from the recent international meeting of Radiocommunication Sector Task Group 2-2, states:

> there appears to be some sharing margin available between certain MSS and fixed service systems which [has] not been fully exploited. First, Non-GSO MSS satellite systems have more system[ ] design variables than GSO MSS systems. For example, Doc. 2-2/26 indicates the influence of spot beam use on non-GSO MSS satellites in improving the possibility of sharing. Also, Doc. 2-2/31 shows how system pfd levels can be improved by taking account of the orbital transmission characteristics of a particular system. Doc. 2-2/27 indicates how the pfd level can be improved as a consequence of the statistical properties of the system implemented.

Input document 2-2/27 (Tech. App. Attachment 2) referred to in Sector Task Group 2-2's report contains the results of a simulation of interference into analog radio-relay routes from LEO satellites of the Globalstar system. This computer simulation of possible interference from the Globalstar system into terrestrial fixed stations indicates that, at the three latitudes sampled, the interference levels into the fixed service network are at or below the limits stated in Recommendation 357, which defines both short- and long-term limits of interference allowed into analog angle/modulated radio-relay systems in bands shared with the fixed satellite service (FSS). The paper concludes that it may be possible to impose PFD limits on MSS satellites which are higher than those specified in Radio Regulation No. 2566 (see RR 753F).

2. To Allow Efficient and Effective Coordination, Footnote 753F Should Be Designated a "Trigger."

The Commission should clarify that any PFD "value" adopted is intended to be a "trigger," rather than an absolute limit. This is the approach taken in a United States submission to Radiocommunication Sector Task Group 2-2 as well as in the output of the most recent international meeting of Task Group 2-2. Annex 1 to Document 2-2/TEMP/3-E (Feb. 3, 1994), provides that, in the case of non-GSO MSS systems, "RR 726 requires use of Resolution 46 procedures to bring into service non-GSO MSS systems for coordination with terrestrial services if the pfd exceeds the limits in No. 2566."

Document 2-2/TEMP/1 (Rev. 5), Annex 1, recommends a three-step approach for coordinating non-GSO MSS systems with terrestrial systems. This process would utilize the PFD as a preliminary determination to determine if further steps would need to be taken. As proposed, the PFD value would be higher than that currently in RR 2566. If the non-GSO MSS system met this level, no further action would be required. If the non-GSO MSS system did not meet the level, a technical examination would be undertaken, taking into account the individual system characteristics, to determine if actual interference to terrestrial systems might occur. This examination may enable the non-GSO system to go forward without the need for coordination with numerous administrations. Only if FSS protection levels were exceeded in the second step would coordination be required.

The flexible "trigger" procedure described in this document would serve the public interest by allowing MSS systems to minimize time-consuming and costly coordinations for fixed service interests as well as other MSS systems. The Commission should, therefore, adopt this approach.

E. ITFS/MMDS Systems Operating Above 2500 MHz will Not Cause Harmful Interference into CDMA LEO MSS Operations in the 2483.5-2500 MHz Band.

The Commission should make a finding that ITFS/MMDS operations above 2500 MHz will not cause harmful interference into CDMA LEO MSS operations in the 2483.5-2500 MHz band and that no rules need to be adopted concerning ITFS/MMDS. As the Commission notes in the NPRM, the NRC engaged in extensive analysis of interference to and from MSS and the Instructional Television Fixed Service (ITFS) and the Multi-channel Multipoint Distribution Service (MMDS) operating in the adjacent 2500-2690 MHz band. While the NRC found that MSS would not cause harmful out-of-band interference into these services, the Commission notes that "the Committee found a serious potential for out-of-band interference into MSS downlinks at 2483.5-2500 MHz from operations in the lowest frequency portion of the ITFS/MMDS allocation." NPRM, ¶ 63.

LQP has recently concluded field testing to address this conclusion of the NRC. LQP's testing demonstrates conclusively that no harmful interference to MSS operations will result from operations in the ITFS/MMDS allocation.

In Section 2.3.2, LQP discusses the results of its testing and analysis of the potential impact of ITFS on CDMA LEO MSS operations in the 2483.5-2500 MHz band. The only case in which interference might conceivably be caused is the lowest ITFS Channel A-1, which operates at 2500-2506 MHz, immediately above the MSS band. MMDS stations (which have technical characteristics identical to those of ITFS), operate on frequencies above 2506 MHz. LQP, in analyzing both the Commission's Rules governing the operating radiated power of ITFS transmitters, as well as conducting field measurements, determined that the received isotropic power (RIP) of the ITFS visual carrier varies between -70 and -80 dBm. The maximum tolerable interference level of an MSS Mobile Earth Station (MES) receiver using a CDMA waveform and a maximum power control of 10 dB is expected to be -106 dBM. Thus, LQP's calculations indicate that, for MES receivers operating in all except the top MSS frequency channel, projected ITFS interference should be no greater than -130 dBm, well below the -106 dBm tolerated by the MES receiver. In addition, the ITFS carrier frequency is offset approximately 1.9 MHz above the center of the highest MSS channel and 1.3 MHz from the upper band edge of the top CDMA MSS RF channel number 13 (in the case of Globalstar), assuming that the MSS channel is operated exactly at 2500 MHz. The frequency offset virtually assures that no co-channel interference will occur. Furthermore, there will be a guardband with respect to

the upper band edge at 2500 MHz, further reducing ITFS input levels.

In addition, the operational characteristics of CDMA LEO MSS systems considered along with the location of virtually all ITFS transmitters will enable the systems to avoid even the unlikely possibility of interference into the top channel. The Commission should also note that most ITFS transmitters using channel A-1 are located within urban environments which are currently served by terrestrial cellular systems. In such cases, it is likely that the dual-mode CDMA LEO MSS handset would be utilizing the terrestrial cellular system, not the MSS system, so the potential for co-channel operation with ITFS would be near zero. In the unlikely event of interference from ITFS into the top channel of a CDMA LEO MSS system could have the capability to reassign the downlink channel in use, as does GLOBALSTAR.

Although the NRC reached conclusions concerning methods by which out-of-band emissions from the lower frequency ITFS/MMDS operations could protect MSS transmissions, NRC Report, at 25-26, 46-47, LQP recommends that the Commission not adopt any such measures. And, based on LQP's studies, the Commission need not allocate any of the limited 2483.5-2500 MHz for a guardband to protect MSS from ITFS/MMDS.

F. LEO MSS Systems Operating in the 2483.5-2500 MHz Band Will Not Receive Harmful Interference from ISM Equipment Operating at 2450 +/- 50 MHz.

The Commission noted that the NRC was not able to reach consensus regarding the impact of Industrial, Scientific and Medical (ISM) applications in the 2400-2500 MHz band on MSS downlinks operating at 2483.5-2500 MHz band. NPRM, ¶ 66. LQP dissented to the proposed NRC findings that ISM could impact the operation of the MSS downlinks. It continues to be the view of LQP, that ISM devices will not significantly affect MSS reception in the 2483.5-2500 MHz band.

Because of the concerns raised during the NRM, and by the Commission in the NPRM, LQP conducted extensive analyses and field testing of the potential impact of ISM operations on CDMA LEO MSS systems operating in the 2483.5-2500 MHz band. The results of this work is described in Section 2.3.3 of the Technical Appendix.

The primary source for the NRC analysis were an NTIA Report.[49] The NTIA study focused narrowly on the interference from microwave ovens into digital broadcast satellites proposing to use frequencies in the 2300-2400 MHz range which were, at that time, allocated for use by aeronautical mobile use (flight testing). As discussed in the Technical Appendix, the assumptions made in the NTIA study are not applicable to the case of possible ISM interference into MSS downlinks from CDMA LEO MSS satellites. The LQP analysis notes that the NTIA report addresses clear line-of-sight interference into satellites, in

---

[49] NTIA TM-92-154, "Accommodation of Broadcast-Satellite (Sound) and Mobile Satellite Services in the 2300-2450 MHz Band," U.S. Department of Commerce, January, 1992.

contrast to the appropriate analysis for ISM emissions into an MSS receiver at ground level with consideration given to significant impairments from obstructions such as buildings and trees. Further, the measurement technique utilized was insufficient and provided misleading and error-prone information using a peak holding spectrum analyzer.

As discussed in the Technical Appendix, the majority of ISM devices, e.g., microwave ovens, focus center frequencies at 2450 MHz. This concentration was confirmed by measurements made by LQP in densely populated residential, industrial and commercial regions in California. The results of these measurements, discussed in detail in Attachments 4 and 5 to the Technical Appendix indicate that the 2483.5-2500 MHz band will be relatively interference-free.

Furthermore, even in the case of a mobile earth station (MES) moving past an operating microwave oven, little or no interference may be caused because of the limited number of high-level pulses from the oven. In the rare case of interference caused by the fixed operation of an MES in the immediate vicinity of an operating oven, CDMA LEO MSS systems, such as GLOBALSTAR, will have the capability to move the user to another downlink channel. Several downlink channel shifts could be made automatically, if necessary, without impact on the transmission.

The extensive data collected by LQP during its analysis demonstrates that ISM transmissions are extremely unlikely to impair receipt of MSS signals, and in the remote instances any

undue interference might occur, dynamic operational techniques will enable mitigation of such interference.

G. LEO MSS Systems Can Protect Fixed-Service Systems Operating Under RR 730 and RR 732.

The Commission points out that MSS systems must protect fixed service systems operating in the 1550-1645.5 MHz band on a primary basis in 16 countries pursuant to RR 730. GLOBALSTAR's operating parameters, which will enable it to operate without harmful interference to fixed services, will similarly permit it to operate without harmful interference to systems operating pursuant to RR 730. As discussed above, the cases of ground-based aeronautical radionavigation services operating pursuant to RR 732 are extremely limited in terms of geographical scope, and LQP also will be able to protect such systems.

VIII. THE COMMISSION MUST MAKE FEEDER LINKS BELOW 15 GHZ AVAILABLE FOR MSS SYSTEMS.

In order to ensure that U.S. LEO MSS systems will be able to construct and deploy within the shortest possible timeframe, to the benefit of U.S. industry and user public, the Commission must make feeder links available in the frequency bands required by a variety of system designs, including that of GLOBALSTAR. As the Commission is aware, LQP has applied for feeder links in frequency bands below 15 GHz.[50] Feeder links in these bands are

[50] LQP's feeder link requirements were further refined, during the Negotiated Rulemaking, to indicate that 200 MHz in each direction is required. The additional bandwidth requirement

needed to ensure that LQP will be able to implement its system as designed, to provide low-cost, ubiquitous telecommunications services and interface seamlessly with existing telecommunications networks.

Accordingly, LQP asks that the Commission take the following actions:

(1) make available and authorize feeder links for LEO MSS systems in the C, Ku, and Ka-bands for both uplinks and downlinks;[51]

(2) authorize the use of reverse band working (RBW) for FSS allocations below 15 GHz for MSS feeder links;

(3) allocate 200 MHz within the bands 6425 to 7075 MHz for LQP feeder downlinks, preferably in the 6875-7075 MHz range;

(4) allocate 200 MHz within the band 5000 to 5250 MHz for LQP feeder uplinks (and work with the Executive Branch to gain agreement for this use);

(5) support and work to achieve co-primary allocations for MSS feeder links, in the above bands, at WRC-95;

---

is a result of increasing the number of beams on-board GLOBALSTAR spacecraft to facilitate sharing with other CDMA LEO MSS systems.

[51] LQP seeks 200 MHz of spectrum in each direction below 15 GHz, preferably in the C-band; Constellation indicated in its application its preference for C-band feeder links; Ellipsat recently identified its preference for feeder links in the range of 18.1-18.6 MHz for its downlink and in the range of 6.425-6.725 MHz or 12.75-13.25 GHz (U.S. TG 4/5-17, dated April 28, 1994); and TRW, Inc. and Motorola have applied for feeder links in the Ka-band.

(6) support other C- and/or Ku-band allocations identified in the Technical Appendix, for MSS feeder links, in FSS bands with RBW, at WRC-95;

(7) adopt the interpretation of RR 2613 proposed in the NPRM, and seek revision of RR 2613, as required, at WRC-95.

These actions would be consistent with the Commission's statement, in the NPRM, of the importance of feeder links in an MSS system. NPRM, ¶ 70. The Commission must expeditiously identify feeder links in several frequency bands which can be used by LEO MSS systems and authorize suitable feeder links below 15 GHz for the GLOBALSTAR system.

As LQP has stated previously,[52] the Commission must make available feeder links below 15 GHz for the GLOBALSTAR system, so that GLOBALSTAR can utilize its proposed system design and provide services at a price which will enable widespread utilization of MSS, beyond the global business traveler. The GLOBALSTAR system design flows from its objective of complementing existing telecommunications systems, rather implementing solely a stand-alone system. The system design utilizes a wide-area downlink feeder beam which is optimized for conventional satellite repeaters. The lack of inter-satellite links and on-board processing necessitates more gateway earth stations which cannot necessarily be located in low rainfall

---

[52] See LQSS Petition for Clarification and Partial Reconsideration, ET Docket No. 92-28 (filed Mar. 30, 1994); Comments of LQSS regarding Preparation for International Telecommunication Union World Radiocommunication Conferences, ET Docket No. 93-198 (filed July 19, 1993).

areas. These GLOBALSTAR system architecture and design choices enable use of a less costly and less complex space segment. Operation of feeder link earth stations in C-band or Ku-band would take advantage of established spacecraft and earth station technology, reducing costs and enabling the use of the GLOBALSTAR system by more countries, more telecommunications service providers for extension of low-cost services, and most importantly, more consumers.

The use of a wide-area downlink feeder beam means that frequencies below 15 GHz are required to avoid the substantial rain fade protection required in the Ka-band. In high rainfall regions and tropical areas rain fade margins of 20-30 dB are common. Satellite power to mitigate these fades with a wide area beam are not practical. Solutions which utilize large earth station antennas or site diversity to mitigate these fades also are impractical and very expensive.

As discussed below, the interest supports accommodating multiple LEO MSS systems through availability of feeder links in requested bands, thereby increasing consumer choices of telecommunications services.

A. The Commission Can Utilize FSS Frequencies in the Reverse-Band Mode for LEO MSS Feeder Links.

The Commission should reconsider its tentative conclusion in the NPRM that it may not be able to accommodate feeder links assignments requested by the applicants. No consideration has

been given to techniques for spectrum use that may enable the Commission to make available feeder links in a range of frequency bands. In particular, the operation of LEO MSS feeder links in reverse band working (RBW) from FSS allocations, has not been considered. LQP believes that the record being compiled on RBW, within the ITU-R, as well as in other fora, provides an ample basis for the Commission to reconsider its preliminary view and make feeder link assignments below 15 GHz.

LQP has performed and continues to perform extensive analyses of the feasibility of utilizing FSS allocations in the reverse direction for MSS feeder links (RBW). The analysis, discussed in Section 3 of the Technical Appendix, confirms that RBW will enable LEO MSS feeder links to be operated in FSS allocations without causing harmful interference to FSS operations. LQP believes that the Commission can and should move forward to make FSS frequencies available for feeder links on this basis.

Although the international allocations do not yet exist for reverse band use of FSS allocations for MSS feeder links, the Commission should make assignments and allocations now and support United States efforts to obtain international allocations at WRC-95. This action will enable U.S. LEO MSS systems to move forward to finalize system and spacecraft design, thereby placing them in a position to commence construction when authorized by the Commission.

Section 3 of the Technical Appendix discusses the papers already presented within the ITU-R on the use of reverse-band working, additional studies which are being submitted by the United States to the upcoming international TG 4/5 meeting, and an exhaustive analysis recently performed by the Conference of European Post and Telecommunications authorities (CEPT). These papers demonstrate that reverse-band working will not cause harmful interference to FSS operations. In the case of the MSS feeder uplink, location of the MSS land earth station at a minimal distance from FSS stations will further minimize any interference potential. LQP has submitted a paper for the upcoming TG 4/5 meeting which addresses the appropriate separation distances of FSS earth stations and MSS feeder link earth stations using FSS allocations in reverse-band mode.[53] The use of these calculated distances will enable siting of MSS land earth stations so as to protect FSS operations.

B. The Commission Should Permit Utilization of the 5000-5250 MHz Band for MSS Feeder Uplinks and Encourage Agreement by the Executive Branch For Its Use.

LQP originally applied for use of the 5150-5216 MHz band for feeder downlinks. GLOBALSTAR System Application, at 111-14 (filed June 3, 1991). The Commission sought the cooperation of NTIA in making these frequencies available for MSS systems. NTIA and the FAA opposed the use of these bands for MSS feeder

[53] See "FSS Earth Station to MSS Land Earth Station (LES) Coordination Distances in Reverse Band Working (RBW) Mode," U.S. TG 4/5-4(Rev. 1).

downlinks, citing possible use of the bands in the future for as yet undetermined aeronautical radionavigation services.[54]

However, the above determinations were made when LQP sought to use these bands for feeder downlinks. Now, based on RBW, LQP proposes to use the 5000-5250 MHz band for feeder uplinks. Such use should cause minimal or no interference to potential aeronautical radionavigation systems that might use the band at some point in the future. Additionally, MSS feeder link earth stations could be located away from airports and other locations at which the radionavigation systems might be installed. LQP expects that Globalstar would require only a few such earth stations in the United States. With regard to international allocations, appropriate revisions could be made to International Footnote 797A at WRC-95.

Review of the use of the 5000-5250 MHz band indicates that, in the United States, as well as on a worldwide basis, the band is very lightly used. The band is available for use, pursuant to International Footnote 796 for microwave landing systems (MLS) for precision approach and landing. However, current plans for the MLS contemplate operations only in the 5030-5091 MHz portion of the band, and, even if MLS is installed, it may not require frequencies above 5150 MHz. The band is currently underutilized and would be highly suitable for MSS feeder uplinks. These

---

[54] See Allocation of 1610-1626.5 MHz and 2483.5-2500 MHz for Use by MSS, Including Non-geostationary Satellites, 9 FCC Rcd 536, 541 nn. 31-32 (1994).

feeder uplinks would, of course, be coordinated with any aviation facilities, as required.

The Commission should work within the Interdepartmental Radio Advisory Committee (IRAC) to seek cooperation from the FAA and NTIA concerning the sharing of this band with commercial MSS systems. LQP will work with the Commission to prepare and present information to IRAC concerning the capability of MSS feeder uplinks to share with possible future aeronautical radionavigation systems in this band.

C. The Commission Should Assign Spectrum within the 6425-7075 MHz Band for LQP Feeder Downlink.

For the LQP feeder downlink, the Commission should assign 200 MHz of contiguous spectrum within the 6425-7075 MHz band. Preferably, this assignment should be made in the 6875-7075 MHz band, which is allocated to the FSS for uplink operations according to the allotment plan developed at the 1988 Space WARC. LQP's feeder links would be operated in reverse direction from the FSS allocation, and as is amply demonstrated in the Section 3 of the Technical Appendix, would not cause harmful interference into assignments of the allotment plan. The 6875-7075 MHz band is lightly used on a worldwide basis, and would impose few coordination difficulties with other satellite systems.

As for terrestrial use in the 6875-7075 MHz band, which encompasses auxiliary broadcast services, including point-to-point, studio transmitter links and electronic newsgathering, extensive sharing analyses performed on LQP's behalf by

Comsearch, Inc., (Tech. App. Attachment 12), demonstrate that LQP's operations are not likely to cause harmful interference into such systems.

As an alternative, 200 MHz could be utilized from the 6525-6875 MHz band. Portions of this band are allocated for FSS uplinks. There are some satellite systems registered in the band, which is also shared with operational-fixed services on a co-primary basis. The Comsearch analysis demonstrates that, while there is extensive microwave use in the band, there is high potential for sharing if appropriate coordination procedures are utilized.

D. MSS Feeder links Could Also be Located in Other Frequency Bands Allocated to the FSS.

Under the International Radio Regulations, feeder links may be located in any bands allocated to the fixed-satellite service (FSS). However, in the case of MSS systems, the operational characteristics of the systems complicate the sharing environment. For this reason, LQP believes that the Commission should first consider the use of the frequency bands discussed in the previous sections. Nevertheless, should some of those bands prove unavailable, LQP believes that it could utilize other C-band or Ku-band FSS frequencies without causing harmful interference to FSS systems.[55]

---

[55] Another U.S. submission to Task Group 4/5, prepared by NTIA, provides detailed information concerning the extent of use of FSS allocations. See U.S. TG 4/5-13.

Specific segments of either the C or the Ku-band allotment plan bands, used in RBW mode would provide favorable feeder link alternatives. In the case of the C-band, the 4500-4800 MHz band could be considered for a feeder uplink. LQP recognizes that, while operating compatibly in reverse-band direction from the allotment plan would pose no difficulties for allotments in the plan,[56] the issue of coordination with terrestrial government systems in the band must be resolved. LQP asks the Commission to seek information from NTIA and other government agencies on the characteristics of systems in this band so that complete sharing analyses can be conducted.

The use of the 10.7-10.95 GHz and 11.2-11.45 GHz bands, which are identified for the Ku-band FSS Allotment Plan downlinks, could be considered for LQP feeder uplinks. These bands are used by common carrier microwave systems in the United States; however, Comsearch's analyses demonstrate that LQP earth stations could be located so as to minimize interference to such systems.

E. Globalstar Feederlinks Would Not Cause Harmful Interference Into Terrestrial Services.

Apart from LQP's extensive work evaluating the impact of GLOBALSTAR feederlinks on FSS operations, LQP has thoroughly reviewed the impact of GLOBALSTAR uplinks and downlinks on

---

[56] Two U.S. submissions to the TG 4/5 meeting support use of the allotment plan bands in reverse direction for LEO MSS feeder links. See TG 4/5-8, authored by FCC Staff, and TG 4/5-10, submitted by COMSAT.